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REMARKSA. Period For Reply

A shortened statutory period for reply was set to expire three months from the mailing date of the Office Action of October 5, 2004. This Preliminary Amendment, as part of an RCE, is being filed on or before January 5, 2005.

B. Status

The Office Action of October 5, 2004 was made final.

C. Disposition Of Claims

Claims 1-21 are pending.

D. Application Papers

At the appropriate time, approval of the formal drawings, submitted with the filing of this case on December 21, 2000, would be appreciated.

E. Priority under 35 U.S.C. §§ 119 and 120

Acknowledgement of the claim for foreign priority would be appreciated.

Receipt of the certified copy was acknowledged on page 2, lines 1-2 of the Office Action of January 15, 2004.

As to domestic priority, this case does not claim domestic priority.

F. Attachments

Applicant filed two PTO-1449 forms in this case (one with the filing of this case on December 21, 2000 and one on February 17, 2003). These PTO-1449 forms were signed and all of the references listed on the forms were initialed by the Patent Office. This is very much appreciated.

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G. Basis for amendmentsG.1. Basis for any amendments to the specification

Basis for the subject matter included by amendment into the specification is specifically pointed out on pages 8-9 of the Amendment and Remarks of May 10, 2004.

G.2. Basis for any amendments to the claims

Independent claim 13 has been amended with the limitation "then" to clearly call out that the crude acrylic acid is charged with the aldehyde treatment chemical prior to the step of distilling. Basis for such amendment includes the specification from page 10, line 23, to page 17, line 4, and page 17, lines 24-25.

Basis for new claim 21, which calls out that the crude acrylic acid is charged with the aldehyde treatment chemical prior to the step of distilling, includes the specification from page 10, line 23, to page 17, line 4, and page 17, lines 24-25.

H. The Office ActionH.1. Page 2 of the Office Action as to 37 CFR1.75(d)(1)

On page 2 of the Office Action, the Patent Office indicated that the specification was objected to as failing to provide proper antecedent basis for certain claimed subject matter, citing 37 CFR 1.75(d)(1) and MPEP § 608.01(o).

In response, the specification has been amended to include the subject matter objected to by the Patent Office. Basis for such subject matter was specifically pointed out on pages 8-9 of the Amendment and Remarks of May 10, 2004.

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Accordingly, it is respectfully submitted that the specification is now in compliance with 37 CFR 1.75(d)(1) and MPEP § 608.01(o).

H.2. Pages 2-4 of the Office Action as to 35 U.S.C. 103(a)

In pages 2-4 of the Office Action, claims 1-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer, Jr. et al. (5,759,358) in view of Fauconet (not Fairmont) et al. (6,352,619). This rejection is respectfully traversed on the basis of applicant's discussion below.

H.2.a. Introduction

One of applicant's inventions herein relates to timing. This timing is as follows:

- adjusting the ratio of the concentration of furfural to the concentration of acrolein in the crude acrylic acid; then
- charging the crude acrylic acid having said ratio with a chemical that treats aldehydes; then
- distilling the crude acrylic acid having said ratio and having said chemical that treats aldehyde.

Such a timing sequence is positively recited in a) the combination of independent claim 1 and its dependent claim 21; and b) in independent claim 13. Neither the Bauer, Jr. et al. or Fauconet et al. references or both in combination disclose or suggest such a timing sequence.

H.2.b. The Bauer, Jr. et al. reference

The Bauer, Jr. et al. reference was discussed in detail in the Remarks dated May 10, 2004 and such discussion is hereby incorporated by reference. However, some main points

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of such discussion are set out below and further points are discussed.

H.2.b.i. All ratios have been identified

Applicant has identified all of the furfural to acrolein ratios found in the Bauer, Jr. et al. reference.

H.2.b.ii. Comparative Example 1

Comparative Example 1 of the Bauer, Jr. et al. reference cannot be applied as against applicant because this example does not include any chemical that treats aldehyde.

H.2.b.iii. Comparative Example 4

Comparative Example 4 cannot be applied as against applicant on the basis of the following two grounds.

First ground

Comparative Example 4 cannot be applied as against applicant because the column in Comparative Example 4 suffered from heavy polymer and other solids formation and after 30 minutes was forced to shut down. Comparative Example 4 is an inoperative example. This is the first reason why Comparative Example 4 cannot be cited as against applicant.

Although the composition of the crude acrylic acid is almost the same between Comparative Example 4 and the present invention, the timing of supplying of the aldehyde treatment chemical is quite different from each other, and this second reason is discussed further immediately below.

Second ground

Comparative Example 4 cannot be applied as against

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applicant because Comparative Example 4 does not teach the claimed timing sequence of:

- adjusting the furfural/acrolein ratio in the crude acrylic acid; then
- charging the crude acrylic acid (having the furfural/acrolein ratio) with a chemical that treats aldehydes; then
- distilling the crude acrylic acid (having said ratio and having said chemical that treats aldehydes).

In contrast, Comparative Example 4 never feeds the chemical that treats aldehyde to the crude acrylic acid that is upstream from the distillation column. Instead, Comparative Example 4 feeds the chemical that treats aldehyde directly to the top of the distillation column. Thus, Comparative Example 4 relates to a time during distillation; Comparative Example 4 does not relate to a time prior to distillation.

The Patent Office asserts on page 3 of the Office Action of October 5, 2004 that "Whether the charging is done prior, during or after distillation, the same result is achieved." This is respectfully traversed.

A different result will be brought if the timing of addition of an aldehyde treatment chemical differs even if the composition of the crude acrylic acid is the same. The concentration ratio of furfural to acrolein by weight is 3.9 (270 ppm/69 ppm) in Comparative Example 4 of the Bauer, Jr. et al. reference, which ratio falls within the claimed range. Comparative Example 4 shows vividly that the results differ, if the timing of an aldehyde treatment chemical differs.

First, applicant begs to differ with the Patent Office's assertion that the same result can be achieved after distillation. The chemical that treats the aldehyde directly relates to distillation. The efficiency of the

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chemical that treats aldehyde and the amount of the chemical that treats the aldehyde directly relates to efficiently eliminating impurities through distillation and to retardation of polymer formation. Please see page 3, lines 7-14 of applicant's specification.

Second, applicant begs to differ with the Patent Office's assertion that the same result can be achieved during distillation. For example, the 162 °C boiling point of fufural is more than 100 °C above the 53 °C boiling point of acrolein. When a chemical (such as the Bauer amine) that treats aldehyde is fed from the top or upper portion of the distillation column to react with the furfural and acrolein (aldehydes), the more than 100 °C difference in the boiling points means that the furfural/acrolein ratio cannot be determined at the reaction or mixing point of the amine with the aldehyde. Further, if in some way the furfural/acrolein ratio can be determined at the reaction or mixing point, such a ratio because of the more than 100 °C difference in boiling points will likely be quite different from any initial ratio such as the 3.9 ratio called out in Comparative Example 4.

Third, in this invention, by charging the chemical that treats aldehydes to the crude acrylic acid of the specific concentration ratio of furfural to acrolein prior to distillation, then at least four compounds enter the distillation column as essentially a whole: the crude acrylic acid, furfural, acrolein, and the chemical that treats aldehydes. Reaction points are thus necessarily different from Comparative Example 4 of the Bauer, Jr. et al. reference.

H.2.b.iv. Adjustment of the furfural to acrolein ratio

The Bauer, Jr. et al. reference does not teach

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adjustment of the furfural to acrolein ratio prior to aldehyde treatment (or at any time). Such is positively claimed in independent claims 1 and 13.

H.2.b.v. Summary as to the Bauer, Jr. et al. reference

All of the furfural to acrolein ratios of the Bauer, Jr. et al. reference have been identified by applicant.

One of the Bauer ratios is inapplicable because such ratio stems from an example that does not add any chemical that treats aldehyde. (This is Comparative Example 1).

One of the Bauer ratios is inapplicable 1) because such ratio stems from an example that suffered from heavy polymer formation; and 2) because such a ratio stems from an example that does not teach the timing as positively claimed. (This is Comparative Example 4).

All of the other furfural to acrolein ratios fall out of the claimed range of independent claim 1.

The Bauer, Jr. et al. reference does not teach the adjustment of the furfural to acrolein concentration of independent claim 13 at any time.

The Bauer, Jr. et al. reference only discloses that a pure grade acrylic acid (PGAA) is required to produce a polymer of a higher molecular weight. The aldehyde level contained in the PGAA is below about ten ppm. Please see column 1, lines 40-61. Further, the Bauer, Jr. et al. reference discloses that additional problems exist when maleic acid and maleic anhydride are present; when their combined level exceeds about 0.1 weight % in CAA, massive solids formation may occur with the excess amine (aldehyde treatment chemical) used. Please see column 2, lines 34-39. The essential feature of the invention of the Bauer, Jr. et al. reference is that two groups of amines are used sequentially and continuously in selectively reducing

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acrolein and furfural and may be advantageously conducted in the presence of maleic acid and maleic anhydride impurities.

It is disclosed that a minimum effective level from 0.1 to 2.0 molar ratio is fed to a first distillation column (column 5, lines 52-61). This "minimum effective level" means the minimum amount of Group A amine required to reduce the acrolein to below 10 ppm. Please see column 7, lines 46-54. Thus, the Bauer, Jr. et al. reference does not suggest the idea that the amount of the aldehyde treatment chemical is reduced as much as possible.

As mentioned above, the Bauer, Jr. et al. reference does not suggest that the treatment efficiency is raised and the amount of the aldehyde treatment chemical can be reduced as a result, by adding the aldehyde treatment chemical to the crude acrylic acid having the specific concentration ratio with the specific timing. Namely, it is important in the present invention that two essential features are satisfied. One is that the crude acrylic acid contains furfural and acrolein of the specific ratio and the other is that the aldehyde treatment chemical is added with the specific timing. There is no prior art which suggests the combination of these two essential features.

H.2.c. The Fauconet et al. reference

The Fauconet et al. reference does not cure any of the above noted deficiencies of the Bauer, Jr. et al. reference.

The Fauconet et al. reference discloses a furfural/acrolein ratio of 0.95 to 1.67.

The Patent Office directs the applicant's attention to column 2, lines 12-19 of the Fauconet et al. reference. Further, the Patent Office directs the applicant's attention to column 2, lines 14 and 15 of the Fauconet et al. reference. Applicant has reviewed such passages. Such

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passages, it is respectfully submitted, do not cure the deficiencies of the Bauer, Jr. et al. reference.

H.2.d. As to the claims being commensurate with arguments

On page 3 of the Office Action, the Patent Office asserts that "the claims are not limited to charging at the pot of the column commensurate with the argument." It is respectfully asserted that the present claims are commensurate with applicant's arguments because:

- Dependent claim 21 (dependent upon independent claim 1) has been added to clearly state that the crude acrylic acid is charged with said aldehyde treatment chemical prior to the step of distilling.
- Independent claim 13 has been amended to include the limitation "then" such that this claim too is limited to the sequence of the crude acrylic acid being charged with the chemical that treats aldehyde prior to the step of distilling.

H.2.e. As to the timing being "not patentably significant"

Page 3 of the Office Action provides that "the timing...is not patentably significant." This is respectfully traversed.

Pursuant to 35 U.S.C. 101, whoever invents or discovers any new and useful process, or any new and useful improvement thereof, may obtain a patent.

Pursuant to 35 U.S.C. 100, the term "process" means process, art, or method.

Applicant's process is patentably significant because neither Bauer, Jr. et al. or Fauconet et al., nor both in combination, disclose or suggest applicant's claimed

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features of either a) the combination of independent claim 1 and dependent claim 21, or b) independent claim 13.

H.2.f. As to new and unexpected results

Page 4 of the Office Action provides that "Thus, in the absence of anything which may be 'new' or 'unexpected result;' a prima facie case of obviousness has been established by the art and has not been rebutted." The Office Action further provides on page 4 that "Unexpected results must be established by factual evidence. Mere arguments or conclusory statements in the specification, applicants' amendments, or the Brief do not suffice."

Where a prima facie case of obviousness has not been made, no factual evidence is required. Bauer, Jr. et al. and Fauconet et al. do not, either alone or in combination, disclose or suggest the claimed invention. Please see the above amendments and discussion. Hence, no prima facie case of obviousness has been made and no factual evidence is required.

I. Summary

As to independent claims 1 and 13, the cited combination of references does not disclose or suggest adjustment of the furfural/acrolein ratio. (Bauer, Jr. et al. discloses different ratios, but not the technical concept or importance of adjusting the furfural/acrolein ratio.)

As to independent claims 1 and 13, the cited combination of references does not disclose or suggest the timing of adjusting the furfural/acrolein ratio (which is prior to the crude acrylic acid being charged with the aldehyde treatment chemical).

As to independent claim 1, when Comparative Examples 1

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and 4 are eliminated from consideration, which they must be, the cited combination of references does not disclose or suggest the furfural/acrolein ratio positively claimed.

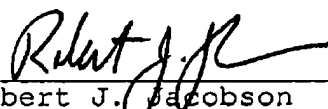
As to dependent claim 21 (dependent upon independent claim 1) and independent claim 13, the cited combination of references does not disclose or suggest the timing of charging the crude acrylic acid with the aldehyde treatment chemical (which is prior to the crude acrylic acid being distilled).

Consideration of applicant's discussion would be very much appreciated.

Respectfully submitted,

Date:

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Robert J. Jacobson
Reg. No. 32,419

Tel. No.: (651) 699-7900
Fax. No.: (651) 699-7901

650 Brimhall Street South
St. Paul, MN 55116-1511